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# Summary of the Technical and Economic Analysis of the “Vía Verde” Project

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## **Summary**

This report presents a summarized version of the analysis of the technical viability of the Vía Verde Project proposed by the Government of Puerto Rico and the Puerto Rico Electric Power Authority (PREPA). It also presents a summarized version of an economic analysis to determine the possible price reduction of the kilowatt-hour sold to the common consumer by PREPA.

Our findings demonstrate that EcoEléctrica will not have the natural gas send-out capacity that the pipeline of the Vía Verde Project would demand. It also demonstrates that all the natural gas that EcoEléctrica could provide, after modifying their facilities, can be used to supply PREPA's Costa Sur Plant that is 1.25 miles away from EcoEléctrica and is already connected to the EcoEléctrica facilities by an existing and operational gas pipeline.

Using real data of the 2010 generation, the economic analysis shows that the Vía Verde Project, if implemented, would only produce savings of 1.1 cents/kWh to the common consumer. This represents about 5% savings on the electric bill of the common consumer.

These two findings render the Vía Verde Project technically unviable, unnecessary, and economically impractical.

## **Technical Analysis**

To operate one of the Costa Sur units 5 or 6 at 85% of their 410 MW rated capacity, it would require a natural gas flow rate of approximately 85 MMscf/d (Million standard cubic feet per day). This flow rate is about the nominal EcoEléctrica send-out capacity. EcoEléctrica demands nominally 88 MMscf/d for its own use and has a maximum send-out capacity of 93 MMscf/d. That is, with the current re-gasification send-out capacity of EcoEléctrica (93 MMscf/d) it is possible to operate only one of the 410 MW units of Costa Sur at 85% of rated capacity. To operate both units 5 and 6 at 85% of the 410 MW rated capacity, it would require a natural gas flow rate of approximately 170 MMscf/d. This is two times the current nominal send-out capacity of EcoEléctrica.

Since EcoEléctrica has solicited to FERC only to duplicate its send-out capacity, this modification would only provide enough natural gas flow rate for EcoEléctrica owns demand plus one of the Costa Sur units (5 or 6) that have been converted to operate with natural gas.

In the event that EcoEléctrica triplicates its send-out capacity, the maximum for which it was originally designed, it would only have enough natural gas send-out capacity for its own needs and for the two Costa Sur units rated at 410 MW to operate at 85% of their capacity. That is, EcoEléctrica would not have additional natural gas to supply the so-called Vía Verde pipeline. This renders the Vía Verde Project unnecessary and unrealizable.

There already exists a natural gas pipeline between EcoEléctrica and Costa Sur. This pipeline has been installed and tested. It is a 1.25 mile long pipeline and has met no

opposition from the community since its environmental impact is minimal and it does not cross populated areas. This pipeline achieves the objective of fossil fuel diversification and does not require further investments.

Let us suppose now that it is desired to supply natural gas for Costa Sur Units 5 and 6 and also to the Vía Verde pipeline to operate the northern plants of Cambalache, San Juan, and Palo Seco. Using data found in the 37<sup>th</sup> Annual Report on the Electric Property of the Puerto Rico Electric Power Authority (PREPA) that reports on Fiscal Year 2010, ending on June, 30 2010, the following conclusions can be drawn.

To achieve the actual 2010 net generation of the three northern plants it would require a total natural gas flow rate of 184 MMscf/d. That is, approximately 2 times the EcoEléctrica send-out capacity to supply the demand of these three plants. This implies that the send-out capacity of EcoEléctrica would have to be three times the current one to supply its own demand and that of the pipeline. This demand, added to the demand of the two Costa Sur units would require five times the EcoEléctrica send-out capacity of natural gas. That is, for EcoEléctrica to supply the demand of the Vía Verde Project, the Costa Sur units 5 and 6, and its own natural gas demand it would require for EcoEléctrica to have five (5) times its current send-out capacity. This is impossible with the EcoEléctrica infrastructure since it was only designed to have three times its current send-out capacity. Table 1 below summarizes the computations.

**TABLE 1: REQUIRED NATURAL GAS FLOW RATE FOR 2010 GENERATION.**

Required for 2010 Generation		Heat Rate of Plant	
Plant	G(MW-h/year)	MBTUng/MW-h	NG rate (MMscf/day)
San Juan	2,762,839	11	81
San Juan C.C.	232,968	8	5
Palo Seco	3,292,247	10.2	89
Cambalache	279,420	11.5	9
Total			184
Number of EcoElectrica Send-Out Capacities = 1.98			

This demonstrates that the Vía Verde project is not necessary for using the EcoEléctrica infrastructure as a natural gas supply since this infrastructure only provides to supply EcoEléctrica's own demand and the demand of Costa Sur units 5 and 6.

In a Caribbean Business article by John Marino, published on June 30, 2011, Volume 39, Number 25, PREPA Executive Director, Miguel Cordero expressed that the Vía Verde natural gas demand will be supplied by Gas Natural de España for the first three years. Although the article does not mention it explicitly, we infer that the method of supplying the gas will be through ships that are equipped with re-gasifiers. It is important to note that the infrastructure to unload the natural gas from these types of ships is totally different from that of the ships that currently supply natural gas to EcoEléctrica. Therefore, supplying natural gas to Costa Sur or to the proposed Vía Verde through this method would require more infrastructure and consequently more investment of money and more time. But even more

important is the fact that if PREPA is considering using ships with re-gasifiers to supply natural gas, then the Vía Verde Project is not necessary. Recall that the Vía Verde project is based on the existence of the only LNG terminal of Puerto Rico which is that of EcoEléctrica. The Vía Verde project is not necessary because the ships with re-gasifiers can be brought close to the plant where the gas will be used. This requires some infrastructure to unload the gas from the ships; but it is a much smaller and much less expensive infrastructure than the proposed Vía Verde pipeline. A more practical solution for using natural gas would be to use EcoEléctrica to supply natural gas to Costa Sur, as previously mentioned, and use re-gasifiers ships to supply natural gas to the Aguirre plant in Salinas and, if necessary, to the San Juan plant. It makes no sense to supply the Vía Verde from a re-gasifier ship. The ship must be moved to where the gas will be used and the Vía Verde pipeline must not be constructed.

According to Generation Director Josué Colón Ortiz, PREPA expects to put out to bid this year a project that would allow for the delivery of natural gas to the Aguirre power complex and therefore, 'Vía Verde' is unnecessary to reach the government's goal of 70% electric generation with natural gas. The Aguirre site has a 900-megawatt thermoelectric plant and a 592-megawatt combined-cycle plant.

## Economic Analysis

Another interesting issue to analyze is that of the possible savings for the common electrical energy consumer supposing that Vía Verde is implemented. In what follows we analyze the possible savings supposing that EcoEléctrica modifies its natural gas facilities so that its send-out capacity is twice the current send-out capacity. This is what EcoEléctrica has solicited from FERC. The generation in each of the northern plants is limited to comply with the restriction of the send-out capacity of 93 MMscf/d. The generation of Cambalache is kept as the actual generation of Fiscal Year 2010 since Cambalache is the most inefficient plant of the system.

Table 2 below shows the savings in Millions of Dollars for the given yearly generation. This analysis was done using actual data of Fiscal Year 2010. The price for natural gas was taken from the actual prices reported by the US-EIA.

**TABLE 2: FUEL SAVINGS USING NATURAL GAS (2010).**

Plant	G(MW-h/year)	H R oil	\$/MBTUo	H R ng	\$/MBTUng	Savings(M\$)
San Juan	1,000,000	7.97	11.27	7.5	4.61	55
San Juan C.C.	1,000,000	10.1	17.15	10	4.61	127
Palo Seco	1,000,000	10.4	11.93	10	4.61	78
Cambalache	279,420	11.5	15.73	11.5	4.61	36
Total	3,279,420					296

The total savings attributed to fuel substitution are \$296 Millions. From these savings it is necessary to subtract the cost of the pipeline. That cost includes the debt of the construction of the pipeline, the debt of the plant conversion to natural gas, the pipeline maintenance contract, and the toll fees paid to EcoEléctrica. These costs add up to \$63.6 Millions for the 2010 generation being considered. This results in real savings of \$232.5 Millions. This is 11.58% of the total fuel cost of 2010 that was \$2,007 Millions. These results are summarized in Table 3 below.

**TABLE 3: REAL SAVINGS.**

Real Savings 2010	\$ Millions
Fuel Savings	296.1
Minus Cost of Pipeline	63.6
Real Savings 2010	232.5
Total Fuel Cost	2,007
Percentage Real Savings	11.58%

That 11.58% is the percentage by which the portion of the cost of the kWh attributed to the fuel cost will be reduced. In 2010 the cost of the kWh attributed to fuel cost was \$0.1293/kWh. That is, 12.93 cents/kWh. In 2010 the common consumer paid 21.6 cents/kWh. A saving of 11.58% represents savings of 1.5 cents/kWh. Of these 1.5 cents, PREPA can only pass 75% to the common consumer, as explained in the analysis of the Center for the New Economy of Puerto Rico. This results in a real saving for the common consumer of 1.1 cents/kWh. With these savings, the cost of the kWh for the common consumer would have been 20.5 cents/kWh. That is approximately 5% savings in the electric bill of the common consumer.

We contend that such a small saving renders the Vía Verde project impractical for the objective of reducing the cost of electricity for the common consumer.

## Conclusions

It has been shown that to use the infrastructure of the liquefied natural gas terminal of EcoEléctrica, the Vía Verde pipeline is unnecessary since all the gas that EcoEléctrica can provide will be consumed by Costa Sur units 5 and 6. In the case that re-gasifiers ships are considered to supply natural gas, those ships must be used to supply the Aguirre plant directly. This alternative has been publically accepted by PREPA officials.

Finally, it has also been shown that the Vía Verde project is economically impractical since it can only reduce the cost of the kWh by 1.1 cents or 5%.

These to findings make the Vía Verde project unviable and unnecessary. We therefore demand that the US Army Corps of Engineers stops considering this project.